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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Application of:

Teruaki OKUDA

Appln. No.: 09/472,988

Filed: December 28, 1999

For: RECORDING MEDIUM, AND RECORDING METHOD USING THE SAME

Examiner: P. Schwartz

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Director, the Commissioner for Patents
Washington, D.C. 20231

SUBMISSION OF ENGLISH TRANSLATION OF PRIORITY DOCUMENT

Sir:

Supplemental to the Amendment filed on March 4, 2002, Applicant respectfully submits the attached sworn English translation of Japanese Priority Document No. 11-001832, filed January 7, 1999. A Claim to Priority and certified copy of this priority document was filed in the present application on March 10, 2000,

Applicant's undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

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DECLARATION

I, Kahei Tachihara, a subject of Japan residing at 5-36-14 Hiyoshidai, Tomisatomachi, Imbagun, Chiba Pref. Japan solemnly and sincerely declare:

That I have thorough knowledge of Japanese and English languages: and

That the attached pages contain a correct translation into English of the specification of the following Japanese Patent Application:

APPLICATION NUMBER	DATE OF APPLICATION
Hei 11(1999)-001832	January 7, 1999

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true: and further, that these statements are made with the knowledge that willful false statements and the like so made, are punishable by fine or imprisonment, or both, under Section 1001, Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signed this 27th day of January, 2002

Kahei Tachihara

Kahei Tachihara

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[Title of the Document] Patent Application
[File Number] 3800114
[Submitted] Jan. 7, 1999
[Addressed to] Director of Patent Office
[International Patent Classification] B32B 29/00
B32B 33/00
[Title of the Invention] Ink Jet Image Recording Medium
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[List of submits]
[Name] Specification 1
[Name] Abstract 1

[Title of the Document] Specification
[Title of the Invention] Ink Jet Image Recording Medium
[What is Claimed is:]

[Claim 1] An ink jet recording medium including at least two ink receiving layers respectively on both surfaces of a paper base, characterized in that an uppermost layer of said both surfaces is made of a porous layer containing a thermoplastic latex resin, and the ink receiving layer held between the uppermost layer and the paper base is made of a porous layer containing an inorganic pigment.

[Claim 2] A recording medium according to claim 1, characterized in that said inorganic pigment is an alumina hydrate.

[Claim 3] An ink jet recording processing method, characterized in that both surface of the uppermost layer are heated to be transparent after ink jet recording is carried out on a recording medium of claim 1.

[Claim 4] A processing method according to claim 3, characterized in that a heating pressure roller is used as means for heating the uppermost layer to be transparent.

[Detailed Description of the Invention]
[0001]
[Technical Field of the Invention]

The present invention relates to an ink jet recording medium, in which an uppermost surface of the image is made transparent after formation of a visible image.

[0002]
[Prior Art]

In a conventional mainstream ink jet image forming apparatus, an image has been formed on a recording medium by forming a visible image by using ink such as a dye or a pigment. In the case of such a constitution, however, drawbacks have been inherent, including discoloring or fading of a visible material caused by a light or ozone in storage of the recording medium, image bleeding caused by contact with moisture, and the like. Also, there has been a problem in which glossiness of the visible image was not sufficiently obtained.

[0003]

In order to cope with the foregoing problems, with respect to a

recording medium used for such image formation, Japanese Patent Laid-Open Nos. 7 (1995)-237348 and 8 (1996)-2090 disclose technologies for further providing a latex layer on an ink absorption layer and heating the latex layer to be a transparent film after ink jet recording in order to improve water resistance and weather resistance of an image.

[0004]

[Problems to be Solved by the Invention]

However, in the recording medium of the above-described conventional example using the paper as the base, there has been a drawback, i.e., curling of the recording medium was greatly changed depending on an environment before the ink jet recording, jamming frequently occurred during ink jet recording, and stable good printing was impossible.

[0005]

Further, there has been a problem, i.e., when the latex layer was heated by hot air drying to form a film after the ink jet recording, simple uniform heating of the recording medium was difficult, and the medium having the film formed was curled. Also, there has been a problem of inefficient formation of the film. Thus, a method was presented to form the latex layer into a film uniformly and efficiently by using two heated rubber rollers to heat the recording medium by applying pressure from both surfaces. However, even in the recording medium having the film formed by the heating and pressurizing with the rollers, a curling state immediately after the formation of the film was good, but great curling occurred when left in a high-temperature and high-humidity environment.

[0006]

On the backside of the recording medium, a thermoplastic latex layer similar to that of a front surface was provided as a back coat layer. However, even by this back coat layer made of a thermoplastic resin, it was impossible to completely prevent incursion of moisture into the paper base. When the paper base absorbed moisture at the end, curling occurred.

[0007]

An object of the present invention is to provide an image recording medium, in which a latex layer can be formed into a uniform film by heating and pressurizing the latex layer, no curling occurs irrespective of an

environment of leaving, and a good image recording characteristic is obtained.

[0008]

[Means for Solving the Problems]

In order to achieve the above-described object, a recording medium including at least two ink receiving layers respectively on both surfaces of a paper base is provided. Each uppermost layer of both surfaces is made of a porous layer containing a thermoplastic latex resin, and the ink receiving layer held between the uppermost layer and the paper base is made of a porous layer containing an inorganic pigment. After ink jet recording, the uppermost layer can be heated to be transparent.

[0009]

[Embodiments]

Next, detailed description will be made of a recording medium of the present invention.

[0010]

The ink jet recording medium of the invention includes at least two ink receiving layers respectively on both surfaces of a paper base. Each uppermost layer of both surfaces is made of a porous layer containing a thermoplastic latex resin, and the ink receiving layer held between the uppermost layer and the paper base is made of a porous layer containing an inorganic pigment. After ink jet recording, the uppermost layer is heated to be transparent.

[0011]

For the above-described paper base, general paper, coated paper, baryta paper or the like can be used, and the baryta paper is preferred for obtaining high-whiteness and high-quality image.

[0012]

As latex for the uppermost layer, latex containing vinyl chloride, vinyl chloride-vinyl acetate, SBR, NBR, acrylic, urethane, polyester, or ethylene, and the latex containing vinyl chloride-vinyl acetate is preferred considering ink permeability.

[0013]

For the ink receiving layer held between the latex layer and the paper base, ink permeated through the upper latex layer must be

completely absorbed at a high speed, and it is made of a porous material containing an inorganic pigment.

[0014]

As a pigment having a large ink absorption capability, soft calcium carbonate, aluminum hydroxide, synthetic alumina, amorphous silica or the like is used. To obtain a high-absorption and high-quality image, the porous layer containing alumina hydrate is preferred.

[0015]

For the heating and pressurizing member for forming the uppermost latex layer into a film, a roller or a belt-shaped article can be used. The roller capable of applying uniform pressure is preferred and, more preferably, a silicon rubber roller having a high releasing property from the latex layer is used.

[0016]

The recording medium of the invention enables double-surface printing to be executed by the conventional ink jet recording. It is possible to obtain a double-surface recording medium having high weather resistance by heating and pressurizing the uppermost layer of both surfaces after double-surface printing, and simultaneously forming a film.

[0017]

In this case, if both surfaces of the ink receiving layer containing the inorganic pigment is subjected to coating in a completely same manner, it is possible to obtain an image in a same quality for both surfaces. If ink jet recording is carried out on one surface, or if an image having a relatively small amount of ink is recorded on one surface, it is possible to reduce the coating amount of the ink receiving layer containing the inorganic pigment on the one surface, which is preferred for manufacturing costs.

[0018]

Next, the embodiments are described, which are for explaining the invention, not limiting the invention in any ways.

[0019]

[Embodiments]

Embodiment 1

Alumina hydrate was used for an ink receiving layer containing an inorganic pigment, and its preparation was made as follows. According to

a method described in US Patent No. 4242271, aluminum octaxide was synthesized, and subjected to hydrolysis to produce an alumina slurry. Water was added to this alumina slurry until a solid part of the alumina hydrate become 5%. Then, a temperature was increased to 80°C and, after maturing reaction for ten hours, this colloidal sol was dried by spraying to obtain alumina hydrate. This alumina hydrate was further mixed/dispersed in ion-exchange water, and prepared to pH 10 by nitric acid. With a maturing period set to five hours, a colloidal sol was obtained. After this colloidal sol was subjected to desalting, acetic acid was added to perform peptization. The colloidal of the above-described alumina hydrate was concentrated to obtain solution of 15 wt.%.

[0020]

On the other hand, polyvinyl alcohol (product name: PVA117, by Clare Inc.) was dissolved in ion-exchange water to obtain solution of 10 wt.%.

[0021]

The solutions of these two types were mixed such that a solid part of the alumina hydrate and a solid part of the polyvinyl alcohol was set to 10:1 by weight, and then agitated to obtain dispersed solution (1). This dispersed solution (1) was coated on a paper base of basis weight of 150g/m^2 to obtain a drying coating amount of 30g/m^2, and a coated layer was formed.

[0022]

Further, on the alumina layer, latex containing vinyl chloride-vinyl acetate having a solid part of 15% (product name: Vinybran 602, by Nisshin Kagaku Kogyo) (called dispersed solution (2)) was coated, and a porous latex layer of a drying coating amount of 5g/m^2 was formed. On an opposite side, dispersed solution (1) was similarly coated to form a coated layer of 30g/m^2. Dispersed solution (2) was coated thereon to form a porous latex layer of a drying coating amount of 5g/m^2.

[0023]

Then, curling was evaluated by the following method.

[0024]

A recording medium of A4 before ink jet recording was horizontally placed with a front surface up under an environment of 30°C 80%, and floating amounts of four corners when left for 24 hours were measured.

[0025]

Further, after ink jet printing, a film was formed by heating and pressurizing the uppermost latex layer, and horizontal placement was carried out with a printing surface (front surface) up under an environment of 30°C 80%, then floating amounts of four corners after a passage of 24 hours were measured.

[0026]

For the above-described pressurizing and heating, a pair of rubber rollers of mirror-finished LTV silicon rubber of 0.5mm on HTV silicon rubber of a thickness of 2mm were used and, passing the recording medium therebetween at a feeding speed of 14mm/sec., with a surface temperature of 170°C of each roller, the latex layer was made transparent.

A result is shown in Table 1.

[0027]

[Table 1]

Table 1

	Floating amount (mm) before ink jet recording	Floating amount (mm) after film formation of latex layer
Embodiment 1	0	0
Embodiment 2	0	0
Embodiment 3	0	0
Comparative example 1	50	30
Comparative example 2	30	20

[0028]

Embodiment 2

Alumina hydrate dispersed solution (1) and latex dispersed solution (2) similar to those of the embodiment 1 were used, and coating was applied on a paper base of basis weight of 150g/m^2 similar to that of the embodiment 1. Coating amounts of an latex layer as an uppermost layer was set to 5g/m^2 for both surfaces, and a coating amount of an ink receiving layer containing alumina hydrate was set to 30g/m^2 on one surface as a front surface (a main printing surface). The coating of 15g/m^2 was carried out on its opposite surface, and thus a recording medium was obtained. For this medium, curling was evaluated by the same method as that of the embodiment 1, and a result is shown in Table 1.

[0029]

Embodiment 3

Alumina hydrate dispersed solution (1) and latex dispersed solution (2) similar to those of the embodiment 1 were used, and baryta paper having a layer containing barium sulfate coated by 20g/m^2 on one surface of a paper base of basis weight of 150g/m^2 was used. The barium sulfate side was set as a front surface (main printing surface). For a constitution of the front surface, an ink receiving layer containing alumina hydrate was coated by 30g/m^2, and an uppermost latex layer was coated by 5g/m^2. For a constitution of a surface not containing barium sulfate, a layer containing alumina hydrate was coated by 15g/m^2, and an uppermost latex layer was coated by 5g/m^2. Thus, a recording medium was obtained. For this medium, curling was evaluated as in the case of the embodiment 1, and a result is shown in Table 1.

[0030]

Comparative example 1

Alumina hydrate dispersed solution (1) and latex dispersed solution (2) similar to those of the embodiment 1 were used. Only one surface of a paper base of basis weight of 150g/m^2 similar to that of the embodiment 1, an ink receiving layer containing an alumina hydrate layer was coated by 30g/m^2 , and a latex layer was coated by 5g/m^2, and thus a recording medium was obtained. For this medium, curling was evaluated by the same method as that of the embodiment 1, and a result is shown in Table 1.

[0031]

Comparative example 2

Alumina hydrate dispersed solution (1) similar to that of the embodiment 1 was used, and an ink receiving layer containing an alumina hydrate layer was coated by 30g/m^2 only on one surface of a paper base of basis weight of 150g/m^2 similar to that of the embodiment 1, and set as a front surface. Then, on both surfaces thereof, by using latex dispersed solution (2) similar to that of the embodiment 1, coating was made by 5g/m^2 on the front surface, and coating was made by 15g/m^2 on its opposite surface, and thus a recording medium was obtained. For this medium, curling was evaluated as in the case of the embodiment 1, and a result is shown in Table 1.

[0032]

[Advantages of the Invention]

As described above, according to the present invention, it is possible to form a latex layer into a uniform film and make it transparent by heating and pressurizing the latex layer of the uppermost layer. Irrespective of an environment of leaving, without any occurrence of curling, it is possible to obtain a double-surface printing image recording medium having a good image recording characteristic and high weather resistance.

[0033]

If ink jet recording is on one surface, or an image of a relatively small amount of ink is recorded on one surface, by reducing the coating amount of an ink receiving layer containing an inorganic pigment on the one surface, it is possible to reduce manufacturing costs of the recording medium

[Title of the Document] Abstract

[Abstract]

[Purpose] To provide an ink jet recording medium capable of obtaining an image having good image characteristics, particularly curling characteristics, and high weather resistance is provided, and having an ink receiving layer on a paper base.

[Constitution] An ink jet recording medium includes at least two ink receiving layers respectively on both surfaces of a paper base. An uppermost layer of both surfaces is made of a porous layer containing a thermoplastic latex resin, and the ink receiving layer held between the uppermost layer and the paper base is made of a porous layer containing an inorganic pigment. After ink jet recording, both surface of the uppermost layer are made transparent by heating.

[Selected Fig.] None